
Textiles — Test method for accelerated hydrolysis of textile materials and biodegradation under controlled composting conditions of the resulting hydrolysate

Textiles — Méthode d'essai pour hydrolyse accélérée des matières textiles et la biodégradation dans des conditions de compostage contrôlées de l'hydrolysates résultant

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Foreword

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Introduction

Textile fibres can be classified into natural fibres and man-made fibres according to ISO/TR 11827. Some of man-made fibres manufactured from organic materials are biodegradable and can be divided into three major categories in relation to their origin, i.e. natural material base, biology base and petroleum base. The representative bio-based, man-made biodegradable fibre is polylactide and petroleum-based, man-made biodegradable fibres are manufactured from polyethylene terephthalate succinate, polycaprolactone, polypropylene carbonate, polybutylene succinate or copolymer using them.

The biodegradation of petroleum-based fibres is relatively slow compared to biology-based or natural fibres due to the chemical structure. In addition, the rate of biodegradation of textile materials such as fibres and yarns can also be affected negatively by high molecular weight, degree of crystallinity and orientation occurred during the spinning. Although some standards refer to the instrument analysis, such as gas chromatograph or infrared analysis, the process and calculation method are not standardized. Therefore, it is difficult to determine the biodegradation of petroleum-based textile materials using the existing standards available for natural fibres, biology-based fibres or plastic materials used for packaging.

To overcome these difficulties, the new test method is proposed by a combination of accelerated hydrolysis and biodegradation using instrument analysis for analysis of evolved carbon dioxide.

Under the composting of textile materials both mechanisms, abiotic and biotic processes, operate together and the microorganisms eventually remove the hydrolysate in a synergistic process. It is difficult and time consuming to reproduce this in the laboratory. For convenience, the accelerated hydrolysis, which is an abiotic process, should be carried out followed by biodegradation subsequently. The rate and extent of molecular weight loss is measured as indicative of losses in physical properties from accelerated hydrolysis and then the biodegradability of hydrolysate is estimated by direct measurement of evolved carbon dioxide with a gas chromatograph.

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